FTPMAN Timestamps

Local Station implementation

Nov 11, 1991

The FTPMAN protocol for Fast Time Plots specifies that data points be tagged with a 16-bit unsigned timestamp in units of 100 μ s that is synch ronized with Tevatron clock event 02, the event which occurs every 5 seconds (75 cycles). For 15 Hz data collection for plotting, appropriate for most Linac devices, it is sufficient to keep a cycle counter that is reset to zero on the cycle marked by the 02 event and incremented each cycle thereafter. Its values will thus range from 0 to 74. But Linac local stations do not have easy access to Tevatron clock event signals, at least until recently.

A hardware module was installed at the klystron rf test area in A0 on Nov 4, 1991, that detects a selected set of 16 Tevatron clock events. This will be used to collect spark statistics according to the accelerator cycle on which they occur. It is believed that spark occurrences are not strictly random. If a spark occurs on one cycle, it is less likely to occur on subsequent cycles. One can induce a spark by raising the power, so by programming the power carefully, the spark rate can be made to be much lower on real acceleration cycles than it might be otherwise. One of the 16 events detected by the module is event 02.

For each detected clock event, the hardware module generates a pulse which is stretched until about 40 msec into the 15 Hz cycle. The resulting status bits are read via two bytes of digital I/O through a rack monitor. Watching successive readings of these two bytes, as each event occurs, a one bit appears in its corresponding bit position.

A data access table entry was added to node 062A which sets the reading value of a pseudo-channel to a count of the cycles since event 02 was a “one”. This entry is as follows:

```
1500  03FE  0000  0000
0000  8000  0186  0001
```

Bit 0186 gives the event 02 status, and channel 03FE is the target channel. The 8000 word specifies that the counter be reset when “1” status occurs.

Three other data access table entries are used to send to all Linac local stations a group-addressed setting that targets the 4th word of the Generally Interesting Data area. (The first 3 words are used to receive time-of-day information sent from node 0516 every minute of every day.) These entries are:

```
7F00  0F00  0000  0000
0000  0000  0000  0000
```

```
00FC  0006  0000  0001
0D23  0000  0014  3FE0
062A  0006  0000  0001
```

The first entry establishes a period of about 4 minutes (`$0F00` cycles). The second entry sends a G.I.D. setting to the LINA group address. The third entry sends the same setting to node 062A, as Classic protocol settings are ignored if they are received over the network from the source node.

In each Linac local station which has FTPMAN installed, the FTPM local application is called every 15 Hz cycle. At that time, the timestamp data word is incremented, resetting it to zero when it exceeds 74. When fast time plot data is being updated and tagged by the current time, this timestamp counter is used and scaled to 100 μ s units.

This scheme is not strictly distributed, in that without node 062A, fast time plot timestamp synchronization cannot be achieved. On the other hand, the signals exist at only one node, so this scheme makes the most of it.) The time-of-day clock is similarly multicast by a node more equal than the rest.)

Tests of the behavior of the fast time plot when receiving data points time stamped according to this scheme exhibited purely *forward* time motion, whereas prior to this implementation various degrees of erratic activity of the plotted data points were observed depending upon how nearly to the time of event 02 time was the request initialized.

This scheme should suffice until a new FTPMAN protocol variant is developed which sends a suggested timestamp value along with the request, an imple men tation designed to help front ends use the FTPMAN facility without the need for Tevatron clock signal input.